AUTOMATED AIRLINES RESERVATIONS SYSTEM

FIELD OF THE INVENTION

The present invention relates generally to the field of automated interactive voice response ("IVR") reservations systems. In particular, the present invention relates to a fully automated frequent flyer IVR reservations system capable of interpreting, recognizing, and responding to spoken user responses that may be accessed by utilizing security identification such as a frequent flyer number, personal identification number, or a zip code.

BACKGROUND OF THE PRESENT INVENTION

Typically, Interactive Voice Response ("IVR") systems are accessed by dialing a local telephone number, an "800" toll-free telephone number, or a "900" pay-to-dial telephone number. Generally, IVR systems are comprised of Automatic Call Distributors ("ACDs") and Voice Response Units ("VRUs"). The function of the ACD is to route high volume inbound telephone calls to the appropriate destinations (i.e., the proper VRU or the proper agent depending on the minimum expected delay and the longest available agent) and to provide a general structure for

managing the customer premises telephone equipment ("CPE"). Specifically, the ACD queues incoming telephone calls to provide a user of the IVR system access to the appropriate first-available destination. The ACD is also capable of playing recorded messages, providing simple prompts, and customized call handling based on call volume or time of day transfer.

The VRU determines the service or information desired by a caller based on information provided by the caller. Callers access information by selecting voice menu prompt options from the voice menus generated by the VRU. Based on the responses received, the VRU transmits the requested information, further prompts the caller for additional menu selections, or transfers the caller to a live agent.

In general, when a caller dials the telephone number associated with the desired IVR system, the inbound telephone call is answered by the caller's local exchange carrier ("LEC") switch. The LEC switch may route a call directly or transfer the call to an inter-exchange carrier for routing.

After the inbound telephone call is routed to the appropriate inter-exchange carrier, the inbound telephone call is routed to an ACD, VRU, or live agent. At this stage, prompt menus may be provided to the caller to

determine the function of the system required by the caller. The prompt menu may consist of an informational prompt or may consist of voice instructions directing the caller to enter information using the caller's touch-tone telephone keypad. In the past, the caller was limited to entering information utilizing the caller's telephone keypad to produce Dual Tone Multiple Frequency ("DTMF") tones which were interpreted by a tone decoder located in the IVR system. However, the improvement in speech recognition technology in recent years has allowed IVR systems to utilize spoken responses by callers. The spoken responses are received and interpreted by speech recognition software located in the IVR system.

The simplest IVR systems allow a caller to retrieve information about specific topics. For example, a caller may dial an automated weather service to access the current weather conditions in a particular area. The inbound telephone call is received from the inter-exchange carrier by an ACD which provides an introductory message prompt to the caller and routes the inbound telephone call to the appropriate VRU. However, if no VRUs are available, the caller is placed in a temporary queue to await the next available VRU. The VRU provides the caller with a voice prompt menu directing the caller to enter information

related to the caller's query. This may be represented by a caller entering a desired city, a zip code, etc. The automated weather service then accesses a national weather database or other similar source to provide the requested weather information to the caller.

As another example, a caller may dial a telephone number associated with a movie schedule IVR to inquire about the movie schedule at a particular movie theatre. In this example, after the proper inter-exchange carrier has been determined by the LEC, the inbound telephone call is transferred directly to a VRU. The VRU directs the caller to enter a zip code or other similar information indicating the desired location such as a city, zip code, etc. The movie schedule IVR queries a movie theatre database or other such database to determine the movie theatres around the caller-entered location. Utilizing the results of the query, the movie schedule IVR directs the caller to choose the desired movie theatre from a voice prompt menu. After the caller chooses the desired movie theatre, the caller is provided the times and listings of all movies playing at the selected movie theatre.

Alternatively, the VRU may direct the caller to enter the name of the movie utilizing the letters associated with each button on the caller's telephone keypad. After the

movie selection is made, the movie schedule IVR system directs the caller to enter the desired location of the movie utilizing such information as a city, zip code, etc. Based on the inputted information, the movie schedule IVR system accesses a movie schedule database to determine if the selected movie is playing in the selected location. The movie schedule IVR system then directs the caller to select options from a movie theatre voice prompt menu formed from the results of the movie schedule database query. After the caller makes a selection from the movie theatre voice prompt menu, the caller is provided the times that the selected movie is playing at the selected movie theatre.

One industry which utilizes IVR systems extensively is the airline industry. Historically, the airline industry has used IVR systems for many applications including customer service, automated flight information, automated reservations, and automated frequent flyer account maintenance. Typically, the customer service IVR systems utilized in the airline industry comprise ACDs, VRUs, and live agents and are typically accessed via an "800" toll-free telephone number. Generally, an airline customer service IVR system greets an inbound telephone call with an introductory voice prompt and provides the caller with a

voice prompt menu. Typically, the voice prompt menu consists of options which allow the software to properly route the call (e.g., the call to be transferred to a live agent or another IVR system, such as a flight information IVR system). In this manner, customer service IVR systems function as a "front-end" to the other IVR systems (e.g., reservations, flight information, etc.) provided by the airline.

An automated flight information IVR system is typically comprised of ACDs and VRUs and is accessed via an "800" toll free telephone number. Generally, the ACDs receive the inbound telephone calls from the inter-exchange carrier and route the calls to the appropriate ACD, which, in turn, routes the inbound telephone call to the appropriate VRU. Each VRU in an automated flight information IVR system often contains the same programming and serves the same function. The VRU greets the caller with a voice prompt and directs the caller to enter information related to the desired flight. The information may include a flight number, date of departure/arrival, time of departure/arrival, etc. Utilizing this information, the VRU queries a flight information database and provides the requested flight information to the caller. Many third-party entities maintain real-time

flight information databases which may be utilized with a flight information IVR system. However, the flight information IVR system may contain its own real-time flight information database.

The reservations IVR systems typically employed in the airline industry are accessed via an "800" toll-free telephone number and consist of ACDs and VRUs. Generally, the reservations IVR systems gather itinerary data from a caller and then transfer the caller to a live reservations agent. For example, an international reservations IVR system for an airline may direct the caller to provide information about the caller's desired itinerary. The requested information may include the desired departure city, desired arrival city, desired departure date, desired arrival date, desired departure time, desired arrival time, class of service (i.e., economy class, business class, first class, etc.), seating preference, etc. The reservations IVR system may utilize caller's vocal responses or caller-entered DTMF tones produced by the caller's keypad.

Once the caller has entered the requisite information in response to the international reservations IVR system's voice prompt menus, the caller-entered itinerary information may be transferred to a live reservations agent

via a "screen pop." Screen-pop is a common method known in the art for transferring caller-entered itinerary information to a live reservations agent. The reservations agent then utilizes the transferred caller itinerary information to search a flight database accessible from the reservation agent's computer terminal. Utilizing the results of the flight information database query, the reservations agent provides the caller a few possible flight itineraries and the system instructs the caller to select from the itineraries presented. If a caller chooses to select one of the presented flight itineraries, the reservation agent obtains credit card information or other payment information from the caller and completes the caller's requested transaction.

Alternatively, instead of transferring the gathered caller information to a reservations agent, the reservations IVR system may access a flight information database and provide the caller with a voice prompt menu listing flight itineraries which closely match the caller's requested itinerary. The caller may then choose the desired flight itinerary from the voice prompt menu. Based on this input, the reservations IVR system queries the caller for payment information, such as a credit card number and expiration date. The system verifies the

caller's credit card information and then completes the caller's transaction for the requested itinerary. By utilizing this system instead of a live reservations agent to process the caller's requested itinerary and verify the caller's credit card information, the amount of time required by live reservations agents to assist callers is reduced. This lowers operating costs for the airline since less reservations agents must be employed.

Many travel organizations also operate and maintain frequent flyer IVR systems which allow a caller to perform frequent flyer account maintenance. Generally, frequent flyer IVR systems require authentication for use of the system. For example, the frequent flyer IVR system may require that the caller enter the caller's frequent flyer number and associated PIN. Other authentication information or combinations of authentication information such as a social security number, home telephone number, birth date, zip code, etc., may also be utilized by the frequent flyer IVR system to authenticate a caller. After the frequent flyer IVR system authenticates a caller, the caller is provided with a voice prompt menu providing a series of account maintenance options. The voice prompt menu may consist of options allowing a caller to inquire about the amount of frequent flyer miles in a caller's account, allow

the caller to change the caller's authentication information, allow the caller to check on the status of reservations made utilizing frequent flyer miles, etc. Frequent flyer information IVR systems currently utilized allow a caller to choose options from voice prompt menus or enter information utilizing vocal responses or the caller's keypad to produce DTMF tones.

SUMMARY OF INVENTION

The main objective of the present invention is to expand and improve upon the functionality of existing reservation systems. Specifically, the present disclosure provides a fully automated reservations system capable of reducing the amount of time required by customers and reservations agents to book reservations. For example, certain key aspects of the present invention include the ability to authenticate users, book and hold reservations, provide different itineraries, and assign seats. In particular, the present invention is designed to function with a frequent flyer system and utilize the frequent flyer miles in a customer's account to book, hold, or complete a reservation without human intervention. The present invention also may include a baggage information system and

a notification system which alerts customers when changes to booked or reserved itineraries have been made.

Although different systems and methods exist for routing a telephone call trough the existing local exchange carrier and inter-exchange carrier infrastructure, an inbound telephone call often terminates at a voice response unit. At the VRU, the customer is interfaced with the reservations system of the present invention. The customer is initially provided a voice prompt menu by the VRU for selecting the options of making a reservation or locating baggage utilizing the baggage information portion of the reservations system.

If the customer selects the option of making a reservation from the initial voice prompt menu provided by the VRU, the customer is required to provide authentication information. The reservations system is capable of accepting and analyzing either customer's vocal responses or customer-entered DTMF tones; however, in the preferred embodiment of the present invention, speech recognition is utilized. For example, if the customer wishes to make a reservation utilizing the customer's frequent flyer miles account, the customer is initially prompted to provide one or more forms of authentication to verify that the customer has a preexisting frequent flyer account established with

the system. For example, the reservations system may require that a customer enter a frequent flyer number or zip code with an associated PIN. Any other authentication information or combinations of authentication information including a social security number, a telephone number, a birth date, etc. may also be utilized with the present invention. In addition, other functionality developed within the call system or routing structure may be utilized to verify a caller. For example, a customer may be identified based on the identification of the calling party's telephone number or other identification means developed by a local exchange carrier or inter-exchange carrier. The reservations system then queries a database containing authentication information, such as a frequent flyer account database, to authenticate the customer-entered authentication information. Based upon the results of the frequent flyer account database query, the reservations system denies or grants the customer access to the reservations system.

The system of the present invention may also utilize biometric authentication means, such as voice-print technology, to authenticate callers. For example, the system of the present invention may ask the customer to state a particular phrase, such as the customer's name.

Speech voice print software embedded in the reservations system then compares the phrase uttered by the customer to the customer's stored voice profile. The system of the present invention may utilize any method of voice recognition to authenticate the customer. If the speech recognition software confirms a positive match, the customer is granted access to the reservations system.

Alternatively, if a customer does not have a preexisting account, the reservations system can create an account for the new user. In this scenario, the reservation system acquires all of the information needed to create a frequent flyer account for the customer and then stores the information in the customer database. However, in one embodiment, the customer cannot utilize the new frequent flyer account until the customer obtains frequent flyer miles.

After the reservations system authenticates the customer, the reservations system collects information from the customer necessary to make a flight reservation. The customer is prompted to provide such information as departure/arrival cities, connecting cities, dates and times, desired class of travel, number of passengers, etc. In the preferred embodiment of the present invention, the customer is able to provide this information to the

reservations system utilizing spoken responses. The customer may, however, utilize the customer's telephone keypad to produce DTMF tones or any other similar means to communicate this information to the reservations system.

If the customer is attempting to utilize frequent flyer miles to make an Awards reservation, the reservations system first accesses an Awards database to determine if the customer has the necessary amount of frequent flyer numbers specified by an awards database. The awards database consists of a look-up table which details the amount of frequent flyer miles required for different flight itineraries. If the customer does not have enough frequent flyer miles, the reservations system notifies the customer and may ask if any alternative flight reservations are desired.

If the customer has the required amount of frequent flyer miles to book the desired flight, the reservations system accesses a database containing flight information to determine if the customer's desired itinerary is available. If the customer's itinerary is not available, the customer can attempt to make another reservation or can terminate the call. If the customer's flight itinerary is available, the reservations system presents all the details of the

flight to the customer and possibly one or more additional flights which may also appeal to the customer.

The customer is given the option of either holding or booking the flight itinerary provided by the reservations system. If the customer chooses to hold the reservation, the customer's selected itinerary is stored and the customer is provided a reference number by the reservations system. If the customer later wishes to book the held flight, the customer is required to supply the reference number to the reservations system. The reservations system utilizes the reference number to retrieve the customer's itinerary from the hold database. The customer may then book the flight if desired.

If the customer elects to book the flight provided by the reservations system, the system may then ask for a credit card number or other payment information. Any method of processing telephone transactions known in the art may be utilized to process the customer's ticketing request. The customer's ticket(s), itinerary, and receipt may then be delivered to the customer electronically. Alternatively, these documents may be mailed to the customer or picked up at the airport. The customer may also utilize the flight reservations system to select seats for the different segments of the customer's itinerary.

If the customer selects the option of locating baggage from the initial voice prompt menu provided by the VRU, the customer is first welcomed to the baggage system and directed to provide the arrival city (i.e., the destination of the baggage). The customer is next directed to provide the arrival date of the baggage. Utilizing the arrival city and arrival date, the baggage information system queries a baggage database which returns a list of all baggage records for the specified city and date.

The customer is then directed to provide the customer's travel information associated with the baggage. The tracer is a combination of letters and/or alphanumeric characters assigned to each piece of baggage as the baggage is checked before the customer's flight. Utilizing the customer's name and the tracer, the baggage information system accesses the list returned from the initial query to determine the status of the customer's baggage. The resulting baggage information is then provided to the customer.

The present invention also incorporates a notification system which notifies a customer if any changes occur to the customer's planned flight itinerary. When a change occurs, the notification system sends a text or voice message to the customer's preferred means of contact stored

in the customer's profile. The methods of contact may include a cellular telephone, e-mail or other computer-based customer notification, a pager, a personal digital assistant, a telephone, a fax machine, or other like modes for contacting an individual. The customer may choose to receive flight status at a scheduled time, if changes occur, or both.

Therefore, it is an object of the present invention to provide an automated reservations system capable of authenticating a customer, booking and holding flight reservations, providing different itineraries to customers based upon customer queries, ticketing flights, and assigning seats.

It is also an object of the present invention to provide an automated reservations system additionally containing a baggage information system for assisting customers in locating their baggage.

It is an object of the present invention to provide an automated reservations system capable of receiving and interpreting customers' vocal responses.

An additional object of the present invention is to reduce the amount of time required for customers to make flight reservations.

Still another object of the present invention is to provide an automated reservations system capable of routing customers to live reservations agent.

Another object of the present invention is to provide an automated reservations system including a notification system for notifying customers of changes to a booked or reserved itinerary.

BRIEF DESCRIPTION OF THE DRAWINGS

A further understanding of the present invention can be obtained by reference to the preferred embodiment set forth in the illustrations of the accompanying drawings. Although the illustrated embodiment is merely exemplary of systems for carrying out the present invention, both the organization and method of operation of the invention, in general, together with further objectives and advantages thereof, may be more easily understood by reference to the drawings and the following description. The drawings are not intended to limit the scope of this invention, which is set forth with particularity in the claims as appended or as subsequently amended, but merely to clarify and exemplify the invention.

For a more complete understanding of the present invention, reference is now made to the following drawings in which:

FIG. 1 depicts a hardware schematic detailing the call flow of a typical inbound telephone call to the automated reservations system of the present invention.

FIG. 2 depicts the call flow diagram utilized in the automated reservations system of the present invention.

FIG. 3 depicts the customer authentication call script diagram contained in the automated reservations system of the preferred embodiment of the present invention.

FIG. 4 depicts the awards booking call script diagram contained in the automated reservations system of the preferred embodiment of the present invention.

FIG. 5 depicts the hold reservation call script diagram contained in the automated reservations system of the preferred embodiment of the present invention.

FIG. 6A depicts the ticketing call script diagram offered to the user after the awards booking call script diagram of FIG. 4.

FIG. 6B depicts the ticketing call script diagram provided to the user as the ticketing procedure progresses

from the customer authentication call script diagram of FIG. 3.

FIG. 7 depicts the preferred embodiment of the seat assignment call script for use with the automated reservations system of the present invention.

FIG. 8 depicts the credit card information retrieval call script for use with the automated reservations system of the present invention.

FIG. 9 depicts the preferred embodiment of the call script diagram for use with the baggage information system according to the present invention.

FIG. 9A depicts the call script diagram utilized to acquire the arrival city from a customer while interacting with the baggage information system according to the present invention.

FIG. 9B depicts the call script diagram utilized to obtain the arrival date from a customer for use with the baggage information system according to the present invention.

FIG. 9C depicts the call script diagram utilized to acquire the last name of the customer for use with the baggage information system according to the present invention.

FIG. 9D depicts the call flow diagram utilized to obtain the tracer information from a customer for use with the baggage information system according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As required, a detailed illustrative embodiment of the present invention is disclosed herein. However, techniques, systems and operating structures in accordance with the present invention may be embodied in a wide variety of forms and modes, some of which may be quite different from those in the disclosed embodiment. Consequently, the specific structural and functional details disclosed herein are merely representative, yet in that regard, they are deemed to afford the best embodiment for purposes of disclosure and to provide a basis for the claims herein, which define the scope of the present invention. The following presents a detailed description of a preferred embodiment of the present invention.

The automated reservations system of the present invention is described with reference to an automated frequent flyer number reservations system wherein a customer may utilize accumulated frequent flyer numbers to make travel reservations. However, it would be apparent to

one skilled in the art that the present invention may be utilized in any circumstance which requires an automated reservations system including, but not limited to, mass transportation, entertainment events (e.g., music concerts, sporting events, etc.), etc.

Referring first to FIG. 1, shown is an exemplary hardware schematic detailing the call flow of an inbound telephone call to the reservations system of the present invention. Customer **101** initially dials the telephone number associated with the reservations system of the present invention. For example, the telephone number may be either a local telephone number, an "800" toll-free telephone number, or a "900" pay-to-dial telephone number. The inbound telephone call is answered by the customer's **101** local exchange carrier ("LEC") **103**. When appropriate, LEC **103** accesses a continuously updated Service Management System ("SMS") 800 database **105a** and SMS 900 database **105b** to determine the proper inter-exchange carrier **107** for handling the telephone call. SMS 800 database **105a** includes a look-up table of all registered "800" toll-free telephone numbers and their associated inter-exchange carriers **107**. Similarly, SMS 900 database **105b** includes a look-up table of all registered "900" pay-to-dial telephone numbers.

After the inbound telephone call has been routed to the appropriate inter-exchange carrier **107**, inter-exchange carrier **107** performs a routing function via network routing equipment **109**. The network routing equipment software then selects the optimum ACD **111** capable of handling the inbound telephone call and returns the appropriate routing label back to inter-exchange carrier **107**.

A continuous, real-time monitoring link is established between network routing equipment **109** and ACDs **111**. The longest available agent and the minimal expected delay for an inbound telephone call is analyzed to determine which ACD **111** is capable of most efficiently handling the inbound telephone call and providing the service requested by customer **101**.

Based on the routing decision, the inbound telephone call is routed to the proper ACD **111**. If ACD **111** is incapable of routing the inbound telephone call immediately to VRU **113**, ACD **111** places the customer in a queue to await the next available VRU **113**. FIG. 1 depicts an ACD **111** connected to two VRUs **113**. However, any number of ACDs **111** and VRUs **113** may be utilized with the system of the present invention. At VRU **113**, customer **101** is interfaced with the automated reservations system of the present invention as described below. Optionally, customer **101** may be

transferred to reservations agent **115** at any point during the call flow by saying "agent." Additionally, the reservations system of the present invention may transfer customer **101** to reservations agent **115** in circumstances when the reservations system of the present invention cannot accommodate customer's **101** requests.

Shown in FIG. 2 is the call flow diagram for use in the automated reservations system in the preferred embodiment of the present invention. Typically, customer **101** accesses IVR system **103** by dialing a telephone number associated with the reservations system. In the preferred embodiment of the present invention, customer **101** is initially prompted to choose to make a reservation or to locate baggage utilizing the baggage information system **202**. If customer **101** chooses to make a reservation, customer **101** is required to provide authentication information in order to access the reservations system. The authentication information can include any type or combination of information that uniquely identifies customer **101**, such as a frequent flyer number and associated PIN, a social security number, birth date, etc. Customer **101** is authenticated by IVR system **103** in customer authentication step **201**. Customer authentication step **201** authenticates customer **101** by acquiring the required

identification data from customer **101**, comparing the data to information contained in customer database **203**, and granting access to the reservations system if the customer-entered information is correct. Authentication step **201** utilizes SAS module **205** to interpret the vocal responses provided by customer **101**.

Customer authentication step **201** may optionally utilize biometric authentication, such as voice recognition, to authenticate customer **101**. For example, to authenticate a customer utilizing voice authentication, customer authentication step **201** prompts customer **101** to speak a certain phrase, such as his or her name. Customer authentication step **201** then compares the uttered phrase to voice profiles stored in customer database **203**. If the customer-spoken phrase is valid, customer authentication step **201** grants customer **101** access to the reservations system.

Customer **101** is then routed to book award step **207**. Book award step **207** acquires the required itinerary data from customer **101**. Itinerary data includes all information necessary to make a reservation such as the desired departure city, arrival city, travel dates, travel times, number of passengers, class of service, etc. In the preferred embodiment of the present invention, the

itinerary data is acquired from customer **101** through vocal responses. The vocal responses are interpreted by book award step **207** utilizing SAS module **205**.

Utilizing the customer-entered itinerary data, book award step **207** queries awards database **209** to determine the number of frequent flyer miles needed for the requested itinerary. Book award step **207** then queries customer database **203** to determine if customer **101** has sufficient frequent flyer miles. If customer **101** does not have the required amount of frequent flyer miles as specified by awards database **209**, book award step **207** notifies customer **101** that sufficient frequent flyer miles are not available for the desired itinerary.

If customer **101** has sufficient frequent flyer miles available, book award step next queries flight information database **211** to determine if the requested itinerary is available. If the requested itinerary is available, book award step **207** provides customer **101** with the itinerary and possibly a number of closely related itineraries. Closely related itineraries are any itineraries that differ from the requested itinerary only slightly. For example, book award step **207** may announce to customer **101** the desired itinerary and an additional itinerary which differs in class of service from the desired itinerary.

If the requested desired itinerary is not available, book award step **207** notifies customer **101** that the requested itinerary is not available and then provides customer **101** with a predetermined number of closely related itineraries. Customer **101** may alternatively request another itinerary by providing new itinerary data to book award step **207**.

Book award step **207** next provides customer **101** with the options of ticketing the reservation, holding the reservation, or transferring to a reservations agent. If customer **101** elects to hold the reservation, customer **101** is routed to hold reservation step **213**. If the customer wishes to ticket the reservation, customer **101** is routed to ticket reservation step **215**.

However, if the caller elects to be routed to reservations agent **115**, book award step **207** forwards all customer-entered information to screen pop to agent step **217**. Screen pop to agent step **217** provides reservations agent **115** with all the customer-entered data at reservation agent's **107** computer terminal. The customer-entered information is transferred to reservations agent **115** in screen pop to agent step **217** so that reservations agent **115** can more efficiently service customer **101**.

Hold reservations step **213** allows customer **101** to put the requested itinerary on hold for a predetermined amount of time. If customer **101** does not ticket the held reservation during the predetermined amount of time, the hold request is cancelled.

Ticket reservation step **215** allows customer **101** to complete a reservations transaction utilizing the reservations system of the present invention. Ticket reservation step **215** acquires all information necessary to issue customer **101** the requested tickets.

However, if customer **101** chooses to locate baggage utilizing baggage information system **202**, customer **101** is first welcomed to the baggage system and directed to provide the arrival city (i.e., the destination of the baggage). Customer **101** may provide the requested information to baggage information system **202** utilizing the customer's **101** keypad or vocal responses. Customer **101** is next directed to provide the arrival date of the baggage. The baggage information system **202** queries baggage database **204** which returns a list of all baggage records for the specified city and date.

Customer **101** is then directed to provide the travel information associated with the baggage. The tracer is a combination of letters and alphanumeric characters assigned

to each piece of baggage as the baggage is checked before the customer's flight. Utilizing the name and tracer of customer **101**, baggage information system **202** accesses the list returned from the initial baggage database **204** query to determine the status of the customer's baggage. The baggage information is then provided to customer **101**.

Referring next to FIG. 3, shown is the call flow diagram utilized for customer authentication step **201** shown in FIG. 2. The preferred embodiment of caller authentication step **201** utilizes a customer's frequent flyer number in combination with a PIN for authentication. However, any information which uniquely identifies a caller, such as a zip code, telephone number, birth date, social security number, etc., may be used in customer authentication step **201**. Biometric authentication methods, such as voice recognition, may also be utilized to authenticate customer **101**. First, customer **101** is prompted for a frequent flyer number step **301** to vocally provide a valid frequent flyer number. Get frequent flyer number step **301**, as well as all other data acquisition steps utilized by caller authentication step **201**, utilize SAS module **205** to recognize and interpret the vocal responses provided by the caller. The frequent flyer number is then repeated to customer **101** by repeat frequent flyer number

step **303** accompanied by a request to verify if the frequent flyer number stated by the system is correct. If customer **101** responds "no" to the repeated frequent flyer number, customer **101** is again prompted to enter a frequent flyer number by get frequent flyer number step **301**.

Alternatively, if customer **101** verifies the accuracy of the repeated frequent flyer number, customer **101** is then asked to supply an alternative verification such as a PIN. The PIN is then repeated to customer **101** by repeat PIN step **307**. If customer **101** responds "no" to the repeated PIN, customer **101** is again prompted to enter a PIN by get PIN step **301**.

If customer **101** verifies that the repeated PIN is correct, the customer-entered information is then processed for authentication by authenticate frequent flyer number and PIN step **309**. Authenticate frequent flyer number and PIN step **309** queries customer database **203** to verify if the customer-entered frequent flyer number and PIN are valid. If the customer-entered information is valid, customer **101** is then routed to book award step **207** or ticket reservation step **215** if customer **101** has a held reservation. However, if the customer-entered frequent flyer number and PIN are not valid, authenticate frequent flyer number and PIN step **309** delivers an error message to customer **101**. For

example, authenticate frequent flyer number and PIN step **309** may repeat to the caller "You have entered an incorrect frequent flyer number and PIN. Let's try again." Then, customer **101** is allowed to enter a new frequent flyer number and PIN utilizing customer authentication step **201**. Alternatively, the telephone call may be terminated if customer **101** fails to enter a valid frequent flyer number and PIN.

Now referring to FIG. 4, shown is an expanded view of book award step **207** (initially depicted in FIG. 2). Book award step **207** collects data from customer **101** in order to develop a flight itinerary and determines if the caller's account has sufficient frequent flyer numbers for the selected itinerary. In the preferred embodiment of the present invention, book award step **207** is only accessible to customer **101** if customer **101** was properly authenticated in customer authentication step **201**.

Book award step **207** first directs customer **101** to speak the desired departure city in get departure city step **401**. Customer **101** preferably provides the departure city to the reservations system through a vocal response. For each data acquisition step in book award step **207**, the customer-provided vocal response is received and interpreted by SAS module **205** (not shown). The customer-

entered departure city is then repeated to customer **101** for verification. Preferably, book award step **207** requires that all customer-entered data be confirmed by customer **101** before proceeding to the next data acquisition step.

If the customer-entered departure city is not a city from which the airline departs, get departure city step **401** plays an error message to customer **101**. An example error message is "We do not travel into or out of <city>, would you like to depart from another city?" If customer **101** responds "yes" to the error message, get departure city step **401** instructs customer **101** to provide a new city. If customer **101** responds "no" to the error message, customer **101** is given the option of being transferred to a reservations agent.

After the customer-entered departure city has been confirmed, book award step **207** next prompts customer **101** to speak the desired arrival city in get arrival city step **403**. Similarly, if the customer-entered departure city is not a city from which the airline departs, get arrival city step **403** plays an error message to customer **101**. An example error message is "We do not travel into or out of <city>, would you like to depart from another city?" If customer **101** responds "yes" to the error message, get arrival city step **403** instructs customer **101** to provide a

new city. If customer **101** responds "no" to the error message, customer **101** is given the option of being transferred to a reservations agent.

If customer **101** enters the same city for both the departure and arrival cities in get departure city step **401** and get arrival city **403**, customer **101** is played an error message by book award step **207**. For example, the error message may be "The flight origin and destination cannot be the same. Would you like to change the origin or destination city?" If customer **101** responds "yes" to the error message, customer **101** is directed to speak a new arrival and/or destination city. If customer **101** responds "no" to the error message, customer **101** is given the option of being transferred to a reservations agent.

Book award step **207** then prompts customer **101** to speak the desired outbound travel date in get outbound travel date step **405**. The customer-entered outbound travel date is then repeated to customer **101** for verification. If the outbound travel date is not valid, get outbound travel date step **405** plays an error message such as "The date you have given is not valid. Let's try again. What date do you want to depart?" Customer **101** then enters a new outbound travel date in response to the error message.

Customer **101** is next prompted to enter in the desired return travel date in get return travel date step **407**. Once customer **101** enters a return travel date, get return travel date step **407** repeats the return travel date to customer **101** for verification. If the return travel date is not valid, get outbound travel date step **405** plays an error message such as "The date you have given is not valid. Let's try again. What date do you want to return?" Customer **101** then enters a new return travel date in response to the error message.

Book award step **207** next directs customer **101** to enter the desired flight class (e.g., First, Business, Coach, etc.) in get class of service step **409**. The customer-entered class of service is then repeated to customer **101** for verification. If the requested class of service is not available, an error message is played. Particular classes of service, such as first class or business class, may not be available on all flights. For example, if customer **101** selects first class, the error message may be "First class is not available on your requested flight. Would you like a different class of service?" If customer **101** responds "yes" to the error message, customer **101** is directed to choose a new class of service by get class of service step **409**. If customer **101** responds "no" to the error message,

customer **101** is given the option of being transferred to a reservations agent.

Customer **101** is then prompted to speak the desired award type in get award type step **411**. For example, one award type may be used if the desired itinerary occurs over one month ahead of the date of scheduling. If the selected award type cannot be handled by the automated reservations system of the present invention, a message such as "To book your requested itinerary, this call must be handled by a reservations agent. Please hold. The next available reservations agent will be with you shortly. I will pass the collected data to the reservations agent" is played to customer **101**. Get award type **411** transfers the customer-entered departure city, arrival city, outbound travel date, return travel date, class of service, and award type to reservations agent **115** via a "screen-pop." A screen-pop transfers all of the caller-entered information to the appropriate field on reservation agent's **115** computer terminal, thereby allowing reservation agent **115** to better assist customer **101**.

Finally, the caller is prompted to speak the number of passengers at get number of passengers step **413**. The automated reservations system of the present invention may optionally have a limit on the number of passengers the

system can book. If the customer-entered number of passengers is greater than this number, an error message is played to customer **101**. An example error message may be "The automated system will book up to six travelers. For more travelers, please hold and the next available representative will be with you. I will pass the collected data to the representative." Get award type step **411** then transfers the customer-entered departure city, arrival city, outbound travel date, return travel date, class of service, award type, and number of passengers to reservations agent **115** via a "screen-pop."

Book award step **207** next determines the amount of frequent flyer miles required to complete the requested itinerary in price itinerary step **415**. Price itinerary step **415** utilizes awards database **209** to determine the required number of frequent flyer miles. For example, a domestic flight might require less frequent flyer miles then an international flight.

After the number of frequent flyer miles required for the selected itinerary has been determined, query customer database step **417** determines if customer **101** has sufficient frequent flyer miles to make the requested reservation. Query customer database step **417** accomplishes this by comparing the required frequent flyer miles amount

determined in step **415** to the amount of frequent flyer miles located in customer's **101** frequent flyer account located in customer database **203**. If sufficient funds exist, customer **101** is allowed to either hold the reservation in hold reservation step **213** or to ticket the reservation in ticket reservation step **215**.

However, if customer **101** does not have the required number of frequent flyer miles, query customer database step **417** plays an error message such as "There are not enough miles in your account to book travel for the requirements you have given. Do you wish to reduce the number of passengers traveling?" If customer **101** responds "yes" to the error message, customer **101** is asked to speak a new number of passengers. Price itinerary step **415** and query customer database step **417** are then repeated utilizing the new number of passengers. If customer **101** responds "no" to the error message, customer **101** is transferred to reservations agent **115**.

Referring now to FIG. 5, shown is the hold reservation call flow diagram utilized by hold reservation step **213**. Hold reservation step **213** is utilized by the reservations system of the present invention to allow customer **101** to put the itinerary developed in book award step **207** on hold. After customer **101** decides to place the selected itinerary

on hold, hold reservation step **213** first determines the period of time that the held reservation will be valid for in determine length of hold step **503**. The determined period of time is then announced to customer **101**. If customer **101** fails to ticket the held reservation within the determined amount of time, the held reservation is purged from the reservations system.

Customer **101** is then notified of any fees which may be applicable to a held reservation in warn of fees step **505**. For example, customer **101** may be required by the reservations system to pay a flat fee or a certain percentage of the total cost of the itinerary in order to put it on hold. Seats for the held itinerary are selected utilizing assign seats step **507**. For example, customer **101** is prompted by assign seats step **507** to indicate whether an aisle or window seat is preferred. Utilizing this information, assign seats step **507** queries flight information database **211** to determine which seats are available. Assign seats step **507** is utilized to assign a seat to every passenger in the customer-selected itinerary. Assign seats step **507** then updates the available seating information in flight information database **211** once each seat has been selected.

Once assign seats step **507** is complete, hold reservation step **213** next updates customer database **203** in update customer database step **509** to indicate that customer **101** now has a flight itinerary on hold. The held flight itinerary information is then repeated to the caller for confirmation in hold confirmation step **511**. The held flight itinerary information may include, but is not limited to, a hold reference number, the marketing carrier, the operating carrier, the flight numbers, the departure airport code, the departure city name, the departure date, the departure time, the arrival airport code, the arrival city name, the arrival date, the arrival time, the class of service, the number of passengers by passenger type, the number of frequent flyer miles utilized per ticket, the total number of frequent flyer miles utilized, the taxes and fees per person, the total price per passenger type, the total price for all passenger types, customer's **101** name, customer's **101** frequent flyer number, customer's **101** telephone number, and customer's **101** e-mail. If customer **101** has an e-mail address located in customer's **101** account in customer database **203**, hold confirmation step **511** sends customer **101** a confirmation e-mail.

Now referring to FIG. 6A, shown is the call script utilized by ticket reservation step **215** if customer **101**

chooses to ticket the requested itinerary after book awards step **207** is complete. Customer **101** is first quoted an award summary for review by awards summary step **601**. The awards summary contains such information as the number of passengers by passenger type, frequent flyer miles per ticket, total frequent flyer miles, taxes and fees per ticket, and the total price of the selected itinerary. If customer **101** confirms that all of the award summary information is correct, customer **101** is next prompted to verify that the customer contact information is correct in customer information verification step **603**. Customer information verification step **603** utilizes the contact information located in customer database **203** to prompt customer **101** with contact information for verification. The contact information provided to customer **101** includes information such as the customer's name and associated frequent flyer number, phone number, e-mail, etc.

Ticket reservation step **215** next prompts customer **101** to enter a valid credit card number and expiration date in credit card purchase step **605**. A credit card number is required by the flight reservations system to cover additional costs not covered by frequent flyer miles such as taxes, flight destination charges, etc. Any known credit card transaction technique may be utilized by credit

card purchase step **605** to acquire and process credit card information. For example, credit card purchase step **605** may check the entered credit card number for the appropriate amount of digits.

If a valid credit card number was entered in credit card purchase step **605**, customer **101** is advised of all penalties and restrictions and the check-in procedures required for each purchased ticket in penalties and restrictions step **607** and in check-in procedures step **609**, respectively.

Customer **101** may then utilize assign seats step **507** to select seats as previously described in reference to hold reservations step **213**. After seat selection is completed, customer **101** may elect to book the selected itinerary in ticketing verification step **611**. If customer **101** chooses to accept the selected itinerary, ticketing verification step **611** updates customer database **203** to indicate that customer **101** has purchased the selected itinerary. Ticketing verification step **611** also updates flight information database **211** to indicate that the seats selected by customer **101** are no longer available.

Now referring to FIG. 6B, shown is the call script utilized by ticket reservation step **215** if customer **101** wishes to ticket a previously reserved itinerary. In this

scenario, ticket award step **215** proceeds from customer authentication step **201** instead of book award step **207** as occurs in FIG. 6A. Customer **101** is first directed to provide the outbound flight number, travel date, the last name associated with the held reservation in acquire hold information step **602**. Acquire hold information step **602** queries customer database **203** to retrieve the correct itinerary.

Customer **101** is then quoted an award summary for review by awards summary step **601**. The awards summary contains such information as the number of passengers by passenger type, frequent flyer miles per ticket, total frequent flyer miles, taxes and fees per ticket, and the total price of the selected itinerary. If customer **101** confirms that all of the award summary information is correct, customer **101** is next prompted to verify that the customer contact information is correct in customer information verification step **603**. Customer information verification step **603** utilizes the contact information located in customer database **203** to prompt customer **101** with contact information for verification. The contact information provided to customer **101** includes information such as the customer's name and associated frequent flyer number, phone number, e-mail, etc.

Ticket reservation step **215** next prompts customer **101** to enter a valid credit card number and expiration data in credit card purchase step **605**. A credit card number is required by the flight reservations system to cover additional costs not covered by frequent flyer miles such as taxes, flight destination charges, etc. Any known credit card transaction technique may be utilized by credit card purchase step **605** to acquire and process credit card information.

If a valid credit card number was entered in credit card purchase step **605**, customer **101** is advised of all penalties and restrictions and the check-in procedures required for each purchased ticket in penalties and restrictions step **607** and in check-in procedures step **609**, respectively.

Customer **101** may then elect to book the selected itinerary in ticketing verification step **611**. If customer **101** chooses to accept the selected itinerary, ticketing verification step **611** updates customer database **203** to indicate that customer **101** has purchased the selected itinerary. Ticketing verification step **611** also updates flight information database **211** to indicate that the seats selected by customer **101** are no longer available for purchase.

Now referring to FIG. 7, shown is the preferred embodiment of assign seats step **507** utilized in FIG. 5 and FIG. 6A. Assign seats step **507** first directs customer **101** to enter in the desired seat preference (i.e., an isle seat or a window seat) for the first passenger in the flight itinerary in get seat preference step **701**. To determine if the requested seating preference is available, seat query step **703** queries flight information database **211** which contains the status of all available seats on all available flights. Seat query step **703** then assigns a seat to the first passenger in the flight itinerary and removes the available seat from flight information database **211**. Customer **101** is advised of the seating information in advise seating information step **705**. Get seat preference step **701**, seat query step **703**, and advise seating information step **705** are repeated for every passenger in customer's **101** flight itinerary.

Referring next to FIG. 8, shown is the preferred embodiment of credit card purchase step **605** shown in FIG. 6A and FIG. 6B. Customer **101** is prompted to enter the credit card type in get credit card type step **801**. Customer **101** is next directed to enter the credit card number in get credit card number step **803**. Get credit card number step **803** utilizes credit card number look-up table

805 to determine if the entered credit card number is the appropriate length. For example, a card number has thirteen digits whereas another credit card number has fourteen digits. If customer **101** enters an invalid credit card number as determined by the credit card number query, get credit card number step **803** directs customer **101** to provide a valid credit card number.

If the credit card number entered by customer **101** is valid, customer **101** is directed to enter an expiration month and an expiration year in get expiration month step **807** and get expiration year step **809**, respectively. Next, customer **101** is directed to enter the name as it appears on the credit card in get customer name **811**. Customer **101** is then directed to enter a street address, city, postal code, and country in get street address step **813**, get city step **815**, get postal code step **817**, and get country step **819**, respectively.

Referring next to FIG. 9, shown is the call flow diagram utilized for baggage information system **202** depicted in FIG. 2. Customer **101** is initially greeted by baggage information system **202** in step **901**. Customer **101** is then prompted to choose a preferred language for the voice prompts provided by baggage information system **202** in step **903**. In the preferred embodiment, baggage information

system **202** is capable of providing prompts both in English and Spanish. However, the system of the present invention is capable of providing voice prompts in any language and recognizing customer **101** provided vocal responses in any language. Customer **101** is next prompted to provide an arrival city in step **904**, discussed in greater detail in FIG. 9A. As shown in FIG. 9A, customer **101** is initially prompted to speak the arrival city in step **905**. Baggage information system **202** then determines if the spoken arrival city is located in more than one state in step **907**. For example, if customer **101** speaks "Newark" in step **905**, baggage information system **202** needs to determine if customer **101** requested Newark, New Jersey, Newark, Delaware, etc. If the stated arrival city is located in more than one state, baggage information system **202** provides a list of states to customer **101** that contain the requested arrival city in step **909**. Customer **101** speaks the desired state to baggage information system **202** in step **911**. Thereafter, baggage information system **202** repeats the city, state combination to customer **101** for verification in step **913**. If customer **101** says "no" in response to step **913**, customer **101** is again asked to provide an arrival city by step **905**. If customer **101** responds "yes" to step **913**, baggage information system **202**

next proceeds to step **917** which determines if the airline conducts business in the arrival city.

Similarly, if baggage information system **202** determines that the arrival city name occurs in only one state in step **907**, baggage information system **202** repeats the city, state combination to customer **101** for confirmation in step **915**. If customer **101** responds "no" to step **915**, customer **101** is again asked to provide an arrival city in step **905**. If customer **101** confirms the city state combination, baggage information system **202** next proceeds to step **917** which determines if the airline conducts business in the arrival city.

If baggage information system **202** determines that the airline does not conduct business in the stated arrival city, state, baggage information system **202** repeats the city, state combination to customer **101** in step **919**. If customer **101** responds "no" to step **919**, customer **101** is again asked to provide an arrival city in step **905**. If customer **101** responds "yes" to step **919**, customer **101** is provided an error message by baggage information system **202** in step **921** indicating that the airline does not provide service in the stated arrival city. Customer **101** is then transferred to reservations agent **115** to be assisted with the baggage query.

If baggage information system **202** determines that the airline does provide service in the stated arrival city in step **917**, baggage information system **202** next determines if there is more than one airport in the arrival city in step **923**. If baggage information system **202** determines that there is more than one airport in the stated arrival city, baggage information system **202** provides a list of airports to customer **101** in step **925**. Customer **101** is then prompted to speak the desired airport name in step **925**. The chosen airport is confirmed in step **929**. After the airport name has been confirmed in step **929**, customer **101** is transferred to step **931**. Similarly, if baggage information system **202** determines that there is only one airport in the stated arrival city in step **923**, customer **101** is transferred to step **931** (FIG. 9B).

As shown in FIG. 9B, baggage information system **202** initially directs customer **101** to provide the date the baggage arrived in step **933**. If customer **101** states "I don't know," or a similar message indicating that customer **101** is unaware of the arrival date, customer **101** is provided a notification message in step **935**. Thereafter, customer **101** is directed to step **937**. If customer **101** provides an arrival date to baggage information system **202** in step **933**, baggage information system **202** next determines

if the provided arrival date is within a predetermined threshold in step **939**. A predetermined threshold is utilized because only baggage information for a certain period of time is accessible by baggage information system **202**. For example, if the predetermined threshold utilized by step **939** is five days, baggage information system **202** may only access the last five days of baggage information. If baggage information system **202** determines that the date is not within the predetermined threshold, baggage information system **202** provides customer **101** with a hold message in step **941**. Customer **101** is then transferred to reservations agent **115** for assistance with the baggage information query.

If baggage information system **202** determines that the provided arrival date is within the predetermined threshold, customer **101** is provided a hold message in step **943** indicating that baggage information system **202** is retrieving the baggage information for the provided arrival date from baggage database **204** in step. Customer **101** is then transferred to step **937** (shown in FIG. 9)

Now referring back to FIG. 9, baggage information system **202** next queries baggage database **204** in step **937** utilizing the arrival city and date provided by customer **101** in steps **904** and **931**. Baggage database **204** returns all

baggage information to baggage information system **202** which matches the stated arrival city and date. Customer **101** is then prompted by baggage information system **202** to provide the customer's **101** name and associated tracer assigned to each piece of customer's **101** baggage in step **938** (discussed in greater detail with reference to FIG. 9C).

As shown in FIG. 9C, baggage information system **202** directs customer **101** to provide customer's **101** last name in step **940**. Customer **101** may respond either by stating a last name or by stating "representative." If customer **101** elects to state "representative," customer **101** is provided a hold message in step **942** and then transferred to a reservations agent **115** for assistance. Alternatively, if customer **101** states a last name in response to step **940**, baggage information system **202** repeats the entered last name to customer **101** for confirmation in step **945**. Next, baggage information system **202** queries the search results of step **937** in step **947** to determine if the stated last name is in the search results. If the last name is not in the search results, customer **101** is transferred to a reservations agent **115**. If the last name is in the search results, customer **101** is transferred to step **949** (FIG. 9D).

As shown in FIG. 9D, customer **101** is directed by baggage information system **202** to provide the tracer

associated with the customer's **101** baggage in step **951**. If customer **101** states "I don't know" in response to step **951**, customer **101** is provided a hold message by baggage information system **202** in step **953** and transferred to reservations agent **115** for assistance. If customer **101** provides a tracer in step **951**, baggage information system **202** repeats the tracer to customer **101** for confirmation in step **955**. Once the tracer has been confirmed by customer **101**, baggage information system **202** queries the search results of step **947** in step **957** to determine if baggage information exists for the provided arrival city, arrival date, last name, and tracer. If the provided tracer is not in the search results, customer **101** is provided a hold message in step **959** and transferred to the appropriate reservations agent **115**. However, if the provided tracer is in the search results, customer **101** is provided a confirmation message in step **961** indicating that a matching baggage information record has been found in the database (also depicted in FIG. 9). Now referring again to FIG. 9, baggage information system **202** provides the requested baggage information to customer **101** in step **963**. The baggage information may include, but is not limited to the arrival city, arrival date, customer's first and last name,

baggage location (e.g., gate number, terminal, etc.), type of baggage, baggage status, and estimated arrival time.

The present invention also incorporates a notification system which notifies a customer if any changes occur to the customer's planned flight itinerary. When a change occurs, the notification system sends a text or voice message to the customer's preferred means of contact stored in the customer's profile. The methods of contact may include a cellular telephone, e-mail, a pager, a personal digital assistant, a telephone, a fax machine, etc. The customer may choose to receive flight status at a scheduled time, if changes occur, or both.